

Application No.: 09/761,514
Amendment dated: October 24, 2005
Reply to Office Action of May 24, 2005
Attorney Docket No.: 1064.US

This listing of claims will replace all prior versions and listings of claims in this application:

a.) Listing of Claims

1. (currently amended) A micro optical train manufacturing process, comprising:
installing optical components, which ~~including~~ include mounting structures,
onto an optical bench to form an optical train by bonding the mounting
structures to the optical bench;
after installation of the optical components onto the optical bench, measuring
positions of the optical components of the optical train using a vision
system; and
after measuring the position of the optical components, aligning the optical
components of the optical train in response to the positions by
mechanically engaging and moving the mounting structures to plastically
deform the mounting structures.
2. (Original) A process as claimed in claim 1, wherein the step of installing the
optical components comprises solder bonding the optical components to the
optical bench.
3. (Original) A process as claimed in claim 1, wherein the step of installing the
optical components comprises eutectic solder bonding the optical components to
the optical bench.
4. (Original) A process as claimed in claim 1, wherein the step of installing the
optical components is performed by a precision placement and bonding machine.
5. (Original) A process as claimed in claim 1, wherein the step of installing the
optical components is performed in a solder reflow oven.
6. (Original) A process as claimed in claim 1, further comprising characterizing
an optical property of at least some of the optical components prior to installing
the optical components on the optical bench.

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7. (currently amended) A micro optical train manufacturing process, comprising:
characterizing an optical property of at least some of the optical components
prior to installing the optical components on the optical bench;
installing and bonding the optical components onto an optical bench to form an
optical train;
after installation of the optical components onto the optical bench, measuring
positions of the optical components of the optical train; and
after measuring the position of the optical components, aligning the optical
components of the optical train in response to the positions and in
response to the optical property.
8. (currently amended) A micro optical train manufacturing process, comprising:
determining focal lengths of at least one of the optical components prior to
installing the optical ~~component~~ components on the optical bench;
installing and bonding the optical components onto an optical bench to form an
optical train;
after installation of the optical components onto the optical bench, measuring
positions of the optical components of the optical train; and
after measuring the position of the optical components, aligning the optical
components of the optical train in response to the positions and the
determined focal lengths.
9. (Original) A process as claimed in claim 1, further comprising assembling
optical components prior to attaching the optical components on the optical
bench.
10. (Original) A process as claimed in claim 9, wherein the step of assembling
the optical components comprises solder bonding optical elements to mounting
structures.

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11. (Original) A process as claimed in claim 9, wherein the step of assembling the optical components comprises thermally bonding optical elements to mounting structures.
12. (Original) A process as claimed in claim 1, wherein the optical components are installed on the optical bench to a precision of less than 4 micrometers.
13. (Original) A process as claimed in claim 1, wherein the optical components are installed on the optical bench to a precision of less than 1 micrometer.
14. (Original) A process as claimed in claim 1, wherein the step of determining the positions of the optical components comprises determining positions of the optical components relative to reference marks on the optical bench.
15. (Original) A process as claimed in claim 1, wherein the step of determining the positions of the optical components comprises determining distances between the optical components.
16. (Original) A process as claimed in claim 1, wherein the step of determining the positions of the optical components is performed by a vision system by reference to predetermined features of the optical components.
17. (Original) A process as claimed in claim 1, wherein the step of determining the positions of the optical components comprises determining positions of optical elements of the optical components.
18. (Original) A process as claimed in claim 1, wherein the step of determining the positions of the optical components comprises determining positions of mounting structures of the optical components.
19. (Original) A process as claimed in claim 1, wherein the step of aligning the optical components comprises passively aligning the optical train.

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20. (Original) A process as claimed in claim 1, wherein the step of aligning the optical components comprises plastically deforming the optical components.

21. (Previously presented) A process as claimed in claim 1, further comprising, after aligning the optical components in response to the positions, actively aligning the optical components of the optical train.

22. (Original) A process as claimed in claim 21, wherein the step of actively aligning the optical components comprises deforming the optical components.

23. (Previously presented) A process as claimed in claim 1, further comprising, after aligning the optical components in response to the positions, transmitting an optical signal through the optical train and further aligning the optical components of the optical train in response to the transmission of the optical signal through the optical train.

24. (Previously presented) A process as claimed in claim 23, wherein the step of aligning the optical components in response to the optical signal comprises deforming the optical components.

25. (Previously presented) A process as claimed in claim 23, wherein the step of aligning the optical components in response to the optical signal comprises deforming mounting structures of the optical components.

26. (Previously presented) A process as claimed in claim 23, wherein the step of aligning the optical components in response to the optical signal comprises aligning the optical components to maximize a level of the optical signal that is transmitted through the optical train.

27. (Previously presented) A process as claimed in claim 23, wherein the step of aligning the optical components in response to the optical signal comprises aligning the optical components to maximize a side mode suppression ratio of a tunable optical filter in the optical train.

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28. (Previously presented) A process as claimed in claim 1, further comprising characterizing a position of an optical element on a mounting structure of the optical components prior to installing the optical components on the optical bench by reference to light that is transmitted through the optical element.

29. (Previously presented) A micro optical train manufacturing process, comprising:

characterizing positions of optical elements on mounting structures of optical components prior to installing the optical components on optical benches by reference to light that is transmitted through the optical elements; installing optical components onto the optical benches to form optical trains; after the installation of the optical components on the optical benches, measuring positions of the optical components of the optical trains; and after measuring the positions of the optical components, aligning the optical components of the optical trains in response to the positions of the optical components in the optical trains and the position of the optical elements on the mounting structures of the optical components.

30. (Previously presented) A process as claimed in claim 29, wherein the step of installing the optical components comprises solder bonding the optical components to the optical bench.

31. (Previously presented) A process as claimed in claim 29, wherein the step of installing the optical components comprises eutectic solder bonding the optical components to the optical bench.

32. (Previously presented) A process as claimed in claim 29, wherein the step of installing the optical components is performed by a precision placement and bonding machine.

33. (Previously presented) A process as claimed in claim 29, wherein the step of installing the optical components is performed in a solder reflow oven.

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34. (Previously presented) A process as claimed in claim 29, further comprising determining focal lengths of at least one of the optical components prior to installing the optical component on the optical bench.

35. (Previously presented) A process as claimed in claim 29, wherein the step of measuring the positions of the optical components comprises determining positions of the optical components relative to reference marks on the optical bench.

36. (Previously presented) A process as claimed in claim 29, wherein the step of measuring the positions of the optical components comprises determining distances between the optical components.

37. (Previously presented) A process as claimed in claim 29, wherein the step of measuring the positions of the optical components is performed by a vision system by reference to predetermined features of the optical components.

38. (Previously presented) A process as claimed in claim 29, wherein the step of measuring the positions of the optical components comprises determining positions of optical elements of the optical components.

39. (Previously presented) A process as claimed in claim 29, wherein the step of measuring the positions of the optical components comprises measuring positions of the mounting structures of the optical components.

40. (Previously presented) A process as claimed in claim 29, wherein the step of aligning the optical components comprises passively aligning the optical train.

41. (Previously presented) A process as claimed in claim 29, wherein the step of aligning the optical components comprises plastically deforming the mounting structures.

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42. (Previously presented) A process as claimed in claim 29, further comprising, after aligning the optical components in response to the positions, actively aligning the optical components of the optical train.

43. (Previously presented) A process as claimed in claim 42, wherein the step of actively aligning the optical components comprises deforming the optical components.

44. (Previously presented) A process as claimed in claim 29, further comprising, after aligning the optical components in response to the positions, transmitting an optical signal through the optical train and further aligning the optical components of the optical train in response to the transmission of the optical signal through the optical train.

45. (Previously presented) A process as claimed in claim 44, wherein the step of aligning the optical components in response to the optical signal comprises deforming the mounting structures.

46. (Previously presented) A process as claimed in claim 44, wherein the step of aligning the optical components in response to the optical signal comprises deforming mounting structures of the optical components.

47. (Previously presented) A process as claimed in claim 44, wherein the step of aligning the optical components in response to the optical signal comprises aligning the optical components to maximize a level of the optical signal that is transmitted through the optical train.

48. (Previously presented) A process as claimed in claim 44, wherein the step of aligning the optical components in response to the optical signal comprises aligning the optical components to maximize a side mode suppression ratio of a tunable optical filter in the optical train.

49. (Cancelled)

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50. (Cancelled)